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anticipated by Soane et al. (US Publication 2003/0013369, Soane reference hereinafter.). The examiner rejected claim 1 as being anticipated by Marchi-Lemann et al. (US 6,132,745, Marchi reference hereinafter.). The examiner rejected claims 1-10 as being unpatentable over Glenn et al. (US 6,235,683, Glenn reference hereinafter.).

In response, claims 3, 5 and 6 were cancelled, and claims 1, 2, 7 and 8 were amended to include limitations from the cancelled claims in order to clarify the differences from the prior art.

The differences of the invention claimed in the amended claims from the disclosure of the cited references are explained below.

I. The amended claim 1 and Marchi reference are compared.

Marchi reference discloses cosmetic compositions comprising pigment nanoparticles and fillers. The cosmetic composition includes at least one nanopigment that is selected from nanoparticles of iron oxide, titanium dioxide, zinc oxide, bismuth oxychloride, calcium silicate, chromium oxide, chromium hydroxide, ammonium ferric ferrocyanide, ferric ferrocyanide, kaolin, manganese violet, ultramarine and carbon black. However, the amended claim 1 describes a liquid composition for promoting plant growth that contains titanium dioxide nanoparticles as active ingredient and the particle size of the titanium dioxide nanoparticles ranges from 3 ~ 200 nm.

That is, the use of the amended claim 1 and the use of Marchi reference are completely different although they have the ingredient of titanium dioxide in common since the March reference is related to cosmetic compositions while the amended claim 1 is related to a liquid composition for promoting plant growth. In addition, the size of nanopigment particles ranges from 0.01 to 0.15 microns in Marchi reference, while the size of nanoparticles of the amended claim 1 ranges from 3 to 200 nm.

In addition, the advantageous effects of the Marchi reference are that when the cosmetic compositions are used in makeup, they exhibit greater homogeneity of the color and a coloring which is both transparent and more intense, while the advantageous effect of the present invention is that the liquid composition including titanium dioxide nanoparticles promotes plant growth.

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Therefore, the invention claimed by the amended claim is different from the disclosure of Marchi reference in their use, composition and advantageous effects.

II. Claims 1, 2, 4 and 7~10 are compared with Glenn reference.

Glenn reference discloses a method for enhancing supercooling of a plant to temperatures below about -2.degree. C. The method includes the steps of preventing the formation of ice crystals adjacent the plant by forming a substantially continuous hydrophobic membrane of particulate materials on portions of the plant capable of supporting droplets of water. The particulate material having a particle size distribution wherein up to about 90% by weight of the particles have a particle size of about 100  $\mu\text{m}$  or less, and the substantially continuous hydrophobic membrane has a thickness from about 1  $\mu\text{m}$  to about 1,000  $\mu$ . The particulate material comprises a hydrophilic core and a hydrophobic outer surface and the hydrophilic core comprises at least one of calcium carbonate, mica, talc, kaolin, bentonite, pyrophyllite, dolomite, silica, feldspar, sand, quartz, chalk, limestone, diatomaceous earth, baryte, aluminum trihydrate, and titanium dioxide.

In other words, the Glenn reference is related to a method of preventing freezing of a plant by forming a continuous membrane of particulate materials that have a size of about 100  $\mu\text{m}$  or less, and has a hydrophilic core and a hydrophobic outer surface, and the hydrophilic core comprises at least one of calcium carbonate, mica, talc, kaolin, bentonite, pyrophyllite, dolomite, silica, feldspar, sand, quartz, chalk, limestone, diatomaceous earth, baryte, aluminum trihydrate, and titanium dioxide.

On the other hand, the amended claim 1 describes a liquid composition for promoting plant growth that contains titanium dioxide nanoparticles as active ingredient and the particle size of the titanium dioxide nanoparticles ranges from 3 ~ 200 nm. Also the amended claim 2 describes a liquid composition for promoting plant growth, which contains titanium dioxide nanoparticles, in which the composition contains, as a main component, an aqueous solution containing titanium dioxide colloids; the titanium dioxide nanoparticles have such a particle size ranging from 3 to 200 nm; a pH of the aqueous solution is adjusted with organic or inorganic acid in order to prevent rapid precipitation of the titanium dioxide nanoparticles in the aqueous solution, before the aqueous solution is diluted with water such that titanium dioxide

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concentration is in the range of 1 to 1,000 ppm; and the composition contains adjuvants necessary for plant growth and a surfactant for dispersion. In addition, the claims 4, 7~10 are dependent claims that describe structure of the titanium dioxide colloids, and more detailed limitations for the surfactant and adjuvants for plant growth.

As explained above, the use of claims 1, 2, 4, 7 and 10 and the use of Glenn reference are completely different.

Although they have the ingredient of titanium dioxide nanoparticles in common, the size of particulate material of Glenn reference is about 100  $\mu\text{m}$  or less, while the size of nanoparticles of the present invention ranges from 3 to 200 nm.

In addition, the composition of the present invention contains, as a main component, an aqueous solution containing titanium dioxide colloids; the titanium dioxide nanoparticles have such a particle size ranging from 3 to 200 nm, which is adequate for absorption by a plant; pH of the aqueous solution is adjusted to prevent rapid precipitation of the titanium dioxide; titanium dioxide concentration is adjusted in the range of 1 to 1,000 ppm; and accessorially the composition contains adjuvants necessary for plant growth and a surfactant for dispersion.

Therefore, even if surfactants and dispersants, etc. are added to the ingredient both in the present invention and Glenn reference, the overall construction is totally different between the present invention and the Glenn reference.

Therefore, the invention claimed by claims 1, 2, 4 and 7~10 is different from the disclosure of Glenn reference in their use, composition and advantageous effects.

### III. Claims 1, 2, 4 and 7 are compared with Aubay reference.

Aubay reference discloses a process for cleaning or disinfecting surfaces exposed to light with a film of titanium dioxide. The process comprises the step of depositing a film of titanium dioxide on the surfaces with a film-forming dispersion comprising a continuous phase. The titanium dioxide is in the form of elementary particles whose size is less than 100 nm, and whose specific surface area is greater than 150  $\text{m}^2/\text{g}$ . The continuous phase of the dispersion comprises water or at least one alcohol whose boiling point is less than 120° C. The dispersion has, when it comprises water, a pH different by at least 1 unit, from the value of the isoelectric point of titanium dioxide in the dispersion. The dispersion further comprises at least one film-forming

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organic or organosiloxane polymer interacting with the surface of the titanium dioxide particles by electrostatic bonding.

On the other hand, the amended claim 1 describes a liquid composition for promoting plant growth that contains titanium dioxide nanoparticles as active ingredient and the particle size of the titanium dioxide nanoparticles ranges from 3 ~ 200 nm. The use of the amended claim 1 and the use of Aubay reference are completely different since in Aubay reference a film of titanium dioxide is formed for or cleaning or disinfecting surfaces exposed to light.

The purpose and effect of the present invention is that ultraviolet light is absorbed through the titanium dioxide nanoparticles for promoting plant growth. The purpose and effect of the Aubay reference is that a film of titanium dioxide is used for or cleaning or disinfecting surfaces exposed to light.

Also the amended claim 2 describes a liquid composition for promoting plant growth, which contains titanium dioxide nanoparticles, in which the composition contains, as a main component, an aqueous solution containing titanium dioxide colloids; the titanium dioxide nanoparticles have such a particle size ranging from 3 to 200 nm; a pH of the aqueous solution is adjusted with organic or inorganic acid in order to prevent rapid precipitation of the titanium dioxide nanoparticles in the aqueous solution, before the aqueous solution is diluted with water such that titanium dioxide concentration is in the range of 1 to 1,000 ppm; and the composition contains adjuvants necessary for plant growth and a surfactant for dispersion.

As explained above, the construction of the invention claimed by the amended claim 2 is clearly different from that of Aubay reference that is related a film of titanium dioxide used for or cleaning or disinfecting surfaces exposed to light.

In addition, the claims 4 and 7 are dependent claims of claim 2, and thus has different construction from that of the Aubay reference.

Therefore, the invention claimed by the claims 1, 2, 4 and 7 is different from the disclosure of Aubay reference in their use, composition and advantageous effects.

#### IV. The amended claim 1 and Soane reference are compared.

Soane reference discloses nanoparticles based on permanent treatment of textiles. Soane reference discloses a textile-reactive nanoparticle comprising a payload entrapped within a

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polymeric encapsulator. The polymeric encapsulator comprises at least one textile-reactive functional group on its surface for attaching to a textile fiber.

Paragraph 122 of the Soane reference discloses: "The term "particulate sunblock agent" as used herein refers to the solid physical sunblocks such as titanium dioxide ( $\text{TiO}_2$ ), zinc oxide ( $\text{ZnO}$ ), silica ( $\text{SiO}_2$ ), iron oxide ( $\text{FeO}_2$  or  $\text{Fe}_2\text{O}_3$ ), and the like. These provide a sunscreening or protective benefit by reflecting, scattering, or absorbing harmful UV or visible radiation. In a presently preferred embodiment, the particulate sunblock agent is selected from  $\text{TiO}_2$  and  $\text{ZnO}$ . Dispersed particles of  $\text{TiO}_2$  <30 nm are completely transparent in the visible range but will block UV light. Dispersions of larger  $\text{TiO}_2$  particles (30-35 nm) are cloudy because of the distribution of particle sizes in commercial production. Even larger particles produce a white color. The titanium dioxide may optionally have a protective inorganic coating on the particles, composed of silica, alumina, or zirconia, a mixture of these coatings, or other inorganic coatings. Such compositions are known in the art. These coatings prevent the production of titanium oxide free radicals on the surface of the  $\text{TiO}_2$  particle upon sun exposure, and thus prevent damage to the polymeric encapsulator of the nanoparticle of the invention. Thus, when the barrier textile is to be exposed to significant amounts of light, the titanium dioxide used in the textile-reactive UV-protective material will preferably be coated with an inorganic layer prior to its incorporation into the nanoparticle."

As explained above, Soane reference is related to titanium dioxide nanoparticles that react with textiles in order to block ultraviolet ray. On the other hand, the amended claim 1 describes a liquid composition for promoting plant growth that contains titanium dioxide nanoparticles as active ingredient and the particle size of the titanium dioxide nanoparticles ranges from 3 ~ 200 nm. Therefore the use of the Saone reference is completely different from the use of the amended claim 1.

The purpose and effect of the present invention is that ultraviolet ray is absorbed through a composition having the titanium dioxide nanoparticles as main ingredient for promoting plant growth. The purpose and effect of the Soane reference is that ultraviolet ray is blocked by reacting titanium dioxide nanoparticles with textiles.

Therefore, the invention claimed by the amended claim 1 is different from the disclosure of Soane reference in their use, composition and advantageous effects.

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**CONCLUSION**

The applicant believes that the rejections were obviated by the amendment of claims, and the application is now in condition for allowance: therefore, reexamination, reconsideration and allowance of the claims are respectively requested. If there are any additional comments or requirements from the examination, the applicant asks for a non-final office action.

The Commissioner is hereby authorized to charge payment of any additional fees associated with this communication, or credit any over-payment to Deposit Account No. 16-0310.

Very truly yours,

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Dated: January 9, 2006

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